Office of Technical Assistance Research Proposal

Alternatives for Phenol-Formaldehyde Resin in Impregnating Webs

Background:

Phenol formaldehyde, a thermosetting resin, is used to impregnate web in order to produce water and heat resistance web products. The resin application method utilized is similar to dip and scrape method. By passing the paper through pinch rollers, excess resin is removed; thereby passing the paper through pinch roller controls the resin content of the paper. To polymerize the resin, heat is applied to the impregnated paper. The web is removed from the oven when it is tack free but not fully polymerized. The unreacted liquids such as formaldehyde, solvent (s) and moisture are evaporated and exhausted to the incinerator. Finally, the web is rewound as it exits the oven and stored.

Furthermore, this resin is used as high performance abrasive products, in the insulator materials, for bonding and lamination.

Scope of Problem:

Although, phenol-HCHO may be one of the less expensive resins, and its ingredients polymerize easily and form insoluble coating when cured, it is, nonetheless, associated with serious environmental problems. Phenol-HCHO ingredients are designated as hazardous by the current provisions of the EPA's Resource Conservation and Recovery Act (RCRA). It produces hazardous VOC in the polymerization process. OSHA has called the uncured resin and its ingredients carcinogenic. It is considered to be irritant to skin and eye when exposed directly or inhaled or ingested. It produces hazardous wastes.
Also, toxic solvents are required to adjust its viscosity and clean up the spills.

Objectives of the Research:

The main objective of the research should be to find alternatives for phenol formaldehyde that perform the same function, but are not environmentally hazardous. The alternatives should not contain toxic substances that are subject to section 113 Title III of SARA and 40 CFR372 as well as reportable quantity per OSHA's Hazardous Communication Standard (29 CFR 1910.1200). The alternatives should not produce hazardous VOC, and should not require hazardous solvent.

Scope of Work:

The research should design and formulate an alternative that is particularly applicable for impregnating webs. The formulated product should effectively contribute to the compressibility and smoothness of the webs. It should be easily applied and firmly adhere to the web. Other properties should include well penetration and improving the wet-strength of web similar to or better than the phenol-HCHO resin. For curing it may need curing agent or catalyst. The catalyst used to initiate the curing and polymerization at minimum heat, preferably in two stages similar to phenol formaldehyde resin that would meet the process requirement. OTA can assist in the identification of an industry partner.